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Myxomycetes Of Norfolk Island, South Pacific Ocean

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***Abstract*:** A survey for myxomycetes (plasmodial slime moulds or myxogastrids) was carried out on Norfolk Island in June 2019. The overall objective was to collect both specimens that had fruited in the field under natural conditions as well as specimens appearing in moist chamber cultures prepared with samples of dead plant material collected on the island. However, only three species were recorded as field collections over a period of almost two weeks, so the primary focus of the survey was redirected to collecting samples for moist chamber cultures. Approxmately 120 samples of dead plant material collected from 21 different sampling sites on the island and used to prepare 356 moist chamber cultures yielded a total of 497 specimens. These specimens included at least 48 species in 18 genera. This brings the total number of species and genera now known from Norfolk Island to 55 and 19, respectively.

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Introduction

Myxomycetes (plasmodial slime moulds or myxogastrids) are a group of fungus-like organisms associated with dead plant material in virtually every type of terrestrial ecosystem investigated to date, with approximately 1000 species known worldwide (Lado 2005–2019). The myxomycete life cycle encompasses two very different trophic (feeding) stages, one consisting of uninucleate amoebae, with or without flagella (the term "amoeboflagellate" is used to refer to both types), and the other consisting of a distinctive multinucleate structure, the plasmodium (Martin et al. 1983). Under favorable conditions, the plasmodium gives rise to one or more fruiting bodies containing spores. The fruiting bodies produced by myxomycetes are somewhat suggestive of those produced by higher fungi, although they are considerably smaller (usually no more than 1–2 mm tall).

Norfolk Island is a small island in the South Pacific Ocean located between Australia (1600 km northeast of Sydney) and New Zealand (1100 km northwest of Auckland) (Fig. 1). The island (167° 57' E, 29° 02' S), an Australian external territory, was formed approximately 2.5 million years ago as a result of volcanic activity. Most the island (which has a total extent of only about 35 km^2) consists of an elevated plateau (Fig. 2A), and the highest elevation is 319 m (Mount Bates). The climate is subtropical, and only about 10% of the vegetation is relatively undisturbed. Most of the latter is encompassed in Norfolk Island National Park. Norfolk Island pine (*Araucaria heterophylla* [Salisb.] Franco), now widely planted throughout the tropics and subtropics, is endemic to the island (Fig. 1B).

In April and May 1995, Heino Lepp from the Australian National Herbarium visited Norfolk Island. During his visit, he collected 11 specimens of myxomycetes. Five species in three different genera were represented by these specimens. The authors are not aware of any other records of this group of organisms from Norfolk Island, and the primary objective of the survey reported herein was to document more completely the myxomycetes present on the island.

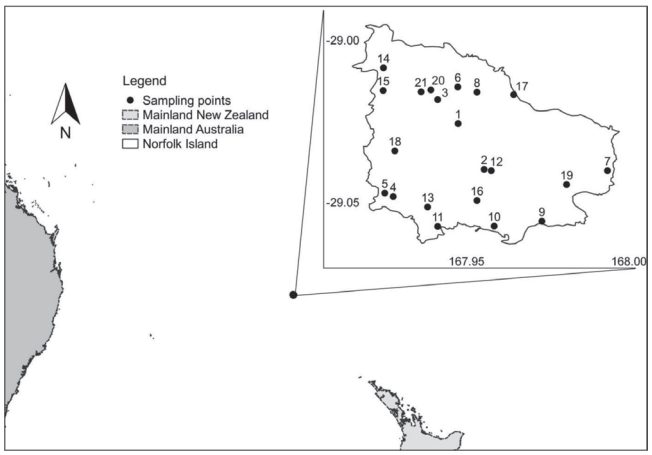

Fig. 1. Location of Norfolk Island in the South Pacific and locations of actual sampling sites on the island.

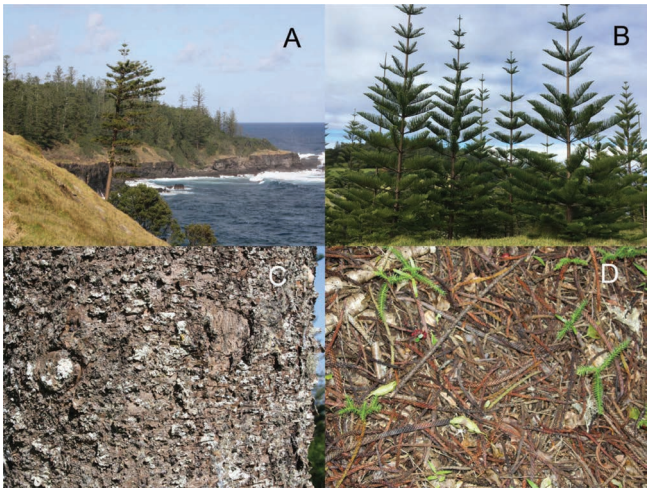

Fig. 2. (A) Coastline of Norfolk Island. (B) Young Norfolk Island pines. (C) Bark surface of Norfolk Island pine. (D) Forest floor leaf litter.

Materials and Methods

The survey for myxomycetes on Norfolk Island was carried out during a two week period in June 2019. The overall objective was to collect both specimens that had fruited in the field under natural conditions as well as specimens appearing in moist chamber cultures prepared with samples of dead plant material collected on the island. At each of the 21 sampling sites visited on the island, all of the substrates on which fruiting bodies of these organisms typically occur were examined in an opportunistic manner as described by Cannon and Sutton (2004). However, only three species were recorded from the field, so the primary focus of the survey was redirected towards collecting samples of various types of dead plant material from each study site. These samples included aerial litter (dead but still attached plant parts above the ground), ground litter (mostly dead leaves but also including other types of debris [Fig. 2D]), woody twigs on the ground, lianas and pieces of the dead outer bark from living trees (Fig. 2C). All samples were allowed to air-dry, mailed back to the Eumycetozoan Laboratory at the University of Arkansas and used to prepare a series of moist chamber cultures. The latter were prepared in the manner described by Stephenson and Stempen (1994) and consisted of disposable plastic Petri dishes (90 mm diameter) lined with filter paper. Enough sample material was placed in each dish to cover the bottom, and then this material was moistened with distilled water. After a period of approximately 24 hours, the pH of each culture was determined with a portable pH meter, after which excess water in the Petri dish was poured off. Moist chamber cultures were placed out of direct sunlight, maintained at room temperature, and checked for evidence of myxomycetes (either plasmodia or fruiting bodies) over a period of several months. When the fruiting bodies of myxomycetes were detected, they were removed, allowed to dry at room temperatures and placed in small pasteboard boxes for permanent storage.

The 21 sampling sites, with information on location (both latitude/longitude and locality on Norfolk Island), type of vegetation, and date visited, are listed below (Fig. 1).

Site 1 (29° 01' 33" S, 167° 56' 51" E), broadleaf forest, Botanic Garden, 11 June 2019; Site 2 (29° 02' 23" S, 167° 57' 19" E), urban setting, apartment at edge of the town of Burnt Pine, 11 June 2019; Site 3 (29° 01' 06" S, 167° 56' 28" E), Norfolk Island pine forest, Old Mountain Track along read to summit of Mt. Pitt, 12 June 2019; Site 4 (29° 02' 54" S, 167° 55' 39" E), Hundred Acres Reserve near Rocky Point, southern entrance, mixed broadleaf/Norfolk Island pine forest, 14 June 2019; Site 5 (29° 02' 50" S, 167° 55' 29" E), Hundred Acres Reserve near Rocky Point, northern entrance, mixed broadleaf/Norfolk Island pine forest, 14 June 2019; Site 6 (29° 00' 52" S, 167° 56' 50" E), Palm Glen, mixed broadleaf/Norfolk Island pine forest, 15 June 2019; Site 7 (29° 01' 01" S, 167° 59' 36" E), Two Chimneys Reserve, open broadleaf forest, 16 June 2019; Site 8 (29° 03' 21" S, 167° 57' 12" E), J. E. Road entrance to Norfolk Island National Park, broadleaf/mixed Norfolk Island pine forest, 16 June 2019); Site 9 (29° 03' 21" S, 167° 58' 24" E), Driver Christian Road above Bloody Bridge, roadside vegetation, 17 June 2019; Site 10 (29° 03' 26" S, 167° 57' 31" E), Bounty Street in Kingston, streamside vegetation, 17 June 2019; Site 11 (29° 03' 27" S, 167° 56' 28" E), Bumbora Reserve, coastal vegetation, 17 June 2019; Site 12 (29° 02' 25" S, 167° 57' 27" E), Queen Victoria's Garden, urban setting, 17 June 2019; Site 13 (29° 03' 05" S, 167° 56' 17" E), Point Ross Reserve, roadside vegetation, 17 June 2019; Site 14 (29° 00' 31" S, 167° 55' 28" E), Anson Bay Road along the northern coast of Norfolk Island, roadside vegetation, 18 June 2019; Site 15 (29° 05' 56" S, 167° 55' 27" E), along road in the northeastern portion of Norfolk Island, *Eucalypus* plantation, 18 June 2019; Site 16 (29° 02' 58" S, 167° 57' 12" E), Watermill Dam, streamside vegetation, 18 June 2019; Site 17 (29° 01' 00" S, 167° 57' 52" E), Cascade Reserve, roadside vegetation, 19 June 2019; Site 18 (29° 02' 03" S, 167° 55' 40" E), Barnabas Chapel, urban vegetation, 19 June 2019; Site 19 (29° 02' 40" S, 167° 58' 51" E), Ball Bay Reserve, coastal vegetation, 19 June 2019; Site 20 (29° 00' 56" S, 167° 56' 15" E), midway up the road to the summit of Mount Pitt, mixed broadleaf/Norfolk Island forest, 20 June 2019; Site 21 (29° 00' 57" S, 167° 56' 14" E), summit of Mount Pitt, forest edge, 20 June 2019.

Results

The samples collected on Norfolk Island were used to prepare a total of 356 moist chamber cultures. Two hundred and seventy-three of the cultures (77%) yielded plasmodia and/or fruiting bodies of myxomycetes. Eighty-three cultures showed no evidence of myxomycetes and 40 produced only plasmodia that did not form fruiting bodies. A total of 497 specimens were recorded from the moist chamber cultures. The appearance of more than a single species in a particular culture was not unusual, and five or more species were recorded from 14 different cultures.

Collectively, the specimens obtained with the use of moist chamber cultures included 48 species belonging to 18 different genera. *Arcyria cinerea* was the single most abundant species, appearing in 69 different moist chamber cultures. Other species represented by specimens appearing in at least 20 cultures were *Didymium iridis* (45), *Physarum oblatum* (41), *Physarum pusillum* (40), *Physarum compressum* (34), *Physarum decipiens* (24), *Didymium squamulosum* (23) and *Lamproderma scintillans* (20). In addition to the specimens appearing in moist chamber cultures, three species (*Arcyria cinerea*, *A. denudata* and *Physarum flavicomum*) were represented by specimens collected in the field.

As a general observation, various types of ground litter (which ranged from broadleaf herbaceous litter to the leaves of Norfolk Island pine) were the most productive substrates, yielding 147 specimens. Lianas and aerial litter were the next most productive, each yielding 107 specimens. Twigs produced 75 specimens and 47 were recorded from bark. The numbers of samples collected for each type of substrate were not equal, so the numbers listed above do not allow absolute comparisons among the different substrates. However, they do provide some evidence of which substrates were the most favorable for myxomycetes.

Although the vast majority (ca 97%) of all specimens could be identified to the level of species, this was not possible in every instance. Most of the unidentified specimens were aberrant or poorly developed. Ten were members of the genera *Physarum* and *Comatricha*, which are sometimes difficult to identify even with relatively well-developed material. One specimen was problematic because it could not be immediately referred to any described species with which the first author is familiar. Unfortunately, it was represented by just two fruiting bodies.

All specimens of myxomycetes collected on Norfolk Island were deposited in the herbarium (UARK) of the University of Arkansas but ultimately will be transferred to the Australian National Herbarium (CANBR).

Annotated List of Species

In the list that follows, species of myxomycetes now known to occur on Norfolk Island are arranged alphabetically by genus and then species. Information is provided on the source of these records (either as specimens collected in the field [f] or specimens obtained from moist chamber [mc] cultures), the range of pH values of the culture(s) in which the specimen appeared if obtained in a moist chamber culture, the substrate upon which it was collected or cultured and the study site(s) from which the specimen itself or the sample of dead plant material used to prepare the moist chamber culture was obtained. Numbers given in parentheses are collecting numbers of the first author.

Arcyria cinerea (Bull.) Pers. (f, mc) Represented by 70 specimens, including one specimen (33710) collected in the field on decaying wood and 69 specimens (including 33721, 33724 and 33916) appearing in moist chamber cultures.

This species was recorded in moist chamber cultures from aerial litter, bark, ground litter, lianas and twigs (pH 5.2 to 8.1). The largest numbers of specimens were recorded from ground litter (24), lianas (20) and twigs (14), sites 1, 2, 3, 4, 5, 6, 7, 8, 11, 13 and 17.

Arcyria denudata (L.) Wettst. (f) Represented by one specimen (33709) collected in the field on decaying wood, site 4.

Arcyria insignis Kalchbr. & Cooke (mc) Represented by two specimens (33911 and 33970), both recorded on samples of the bark of a tree fern (pH 6.4 and 6.6), site 6.

Clastoderma debaryanum A. Blytt (mc) Represented by two specimens (including 34009), both recorded on twigs (pH 5.4 and 5.5), site 6.

Collaria arcyrionema (Rostaf.) Nann.-Bremek. ex Lado (mc) Represented by eight specimens (including 33802 and 34152), recorded from aerial litter, ground litter, lianas and twigs (pH 6.0 to 6.7), sites 4, 5, 6, 8 and 13.

Comatricha elegans (Racib.) G. Lister (mc) Represented by three specimens (including 33886), recorded on lianas and twigs (pH 5.9 to 6.5), sites 4 and 6. One specimen (33915) is problematic but appears to fit this species better than any other.

Comatricha laxa Rostaf. (mc) Represented by a single specimen (34248), recorded on ground litter (pH 6.1), site 6.

Comatricha tenerrima (M.A. Curtis) G. Lister (mc) Represented by a single specimen (34147), recorded on a liana (pH 6.4), site 4.

Craterium leucocephalum (Pers. ex J.F. Gmel.) Ditmar (f) This species was collected by Heino Lepp in 1995 and is represented by three specimens. These are HL1200, Botanic Garden, on leaf litter, 21 April 1995; HL1244, West Palm Glen Track, on leaf litter, 23 April 1995; and HL1334, Hundred Acres Reserve, on dead leaves in a *Eucalyptus* plantation, 1 May 1995. *Craterium leucocephalum* was not recorded in the survey carried out in 2019.

Cribraria confusa Nann.-Bremek. & Y. Yamam. (mc) Represented by a single specimen (34168), recorded on the fibrous bark of an unknown tree (pH 4.5), site 4.

Cribraria minutissima Schwein. (mc) Represented by two specimens (including 34149), recorded on the fibrous bark of an unknown tree (pH 4.3 and 4.4), site 4.

Cribraria violacea Rex (mc) Represented by 13 specimens (including 34025 and 34173), recorded from aerial litter, bark, ground litter, lianas and twigs (pH 5.7 to 8.0). Five specimens each were recorded from bark and twigs, sites 1, 3, 4, 5, 6, 7, 8 and 14.

Diachea leucopodia (Bull.) Rostaf. (mc) Represented by two specimens (including 34153), recorded from aerial litter and ground litter (pH 3.2 and 5.3), sites 12 and 15.

Diderma deplanatum Fr. (mc) Represented by seven specimens (including 33968 and 34174), recorded only from bark (pH 6.1 to 6.7), sites 3 and 4. Four of the seven specimens appeared on cultures prepared with samples of bark from Norfolk Island pine, so *Diderma deplanatum* appears to display a distinct affinity for this tree.

Diderma effusum (Schwein.) Morgan (mc) Represented by four specimens (including 34170 and 34175), recorded from bark and ground litter (pH 6.3 to 6.9), sites 2 and 6.

Diderma hemisphaericum (Bull.) Hornem. (mc) Represented by six specimens (including 34064 and 34155), recorded from aerial litter, ground litter and twigs (pH 6.0 to 6.8), sites 1, 4, 5 and 18.

Didymium anellus Morgan (mc) Represented by a single specimen (34275), recorded from ground litter (pH 6.5), site 6.

Didymium bahiense Gottsb. (mc) Represented by a single specimen (33741), recorded from ground litter (pH 6.4), site 6.

Didymium clavus (Alb. & Schwein.) Rabenh. (mc) Represented by two specimens (including 34003), recorded from aerial litter and bark (pH 6.6 to 7.3), sites 4 and 11.

Didymium difforme (Pers.) Gray (mc) Represented by two specimens (including 33766), recorded from aerial litter and a liana (both pH 6.9), site 1.

Didymium iridis (Ditmar) Fr. (mc) Represented by 45 specimens (including 33751, 34088 and 34107), recorded from aerial litter, bark, lianas, ground litter and twigs (pH 4.9 to 7.6), sites 1, 2,3, 4,5, 6, 7, 8, 11, 13, 16 and 17. This species was most common on aerial litter (24 specimens).

Didymium ochroideum G. Lister (mc) Represented by a single specimen (34065), recorded on ground litter (pH 6.9), site 4.

Didymium squamulosum (Alb. & Schwein.) Fr. & Palmquist (mc) Represented by 23 specimens (including 33713, 33776 and 34018), recorded on aerial litter, ground litter and lianas (pH 5.6 to 7.7). Twelve of the specimens were recorded on aerial litter, and nine were recorded on ground litter, sites 1, 3, 4, 5, 6, 7, 8, 11, 13, 16 and 20.

Echinostelium apitectum K.D. Whitney (mc) Represented by a single specimen (34227), recorded from the fibrous bark of an unidentified tree (pH 4.3), site 4.

Echinostelium minutum de Bary (mc) Represented by three specimens (including 33920), recorded from ground litter and twigs (pH 5.3 to 5.5), sites 6 and 15.

Enerthenema papillatum (Pers.) Rostaf. (mc) Represented by two specimens (including 34038), recorded from the fibrous bark of an unidentified tree (pH 4.3 and 4.5), site 4.

Lamproderma scintillans (Berk. & Broome) Morgan (mc) Represented by 20 specimens (including 33734 and 33748), recorded from aerial litter, ground litter and lianas (pH 5.7 to 8.1). Seventeen specimens (85%) were obtained from ground litter, sites 1, 4, 5, 6, 7, 8, 11, 13 and 18.

Licea operculata (Wingate) G.W. Martin (mc) Represented by two specimens (including 33930), recorded from twigs (pH 6.3 and 6.8), site 1. Both specimens are smaller than published descriptions of this species but conform in all other respects.

Macbrideola decapillata H.C. Gilbert (mc) Represented by five specimens (including 33732), recorded only on the bark of Norfolk Island pine (pH 6.1 to 6.8), sites 3, 4 and 8.

Macbrideola* cf. *oblonga Pando & Lado (mc) Represented by a single specimen (33717), recorded on a liana (pH 7.1), site 6.

Perichaena chrysosperma (Curr.) Lister (mc) Represented by three specimens (including 33975), recorded on aerial litter, ground litter and twigs (pH 6.0 to 6.7), sites 4 and 6.

Perichaena depressa Lib. (mc) Represented by 18 specimens (including 33736 and 33905), recorded on aerial litter, ground litter, lianas and twigs (pH 5.8 to 7.4), sites 1, 4, 5, 6, 11, 13 and 16. Half of the specimens (50%) were associated with ground litter and seven with lianas.

Perichaena dictyonema Rammeloo (mc) Represented by 10 specimens (including 33740 and 34144), recorded from aerial litter, ground litter, lianas and twigs (pH 6.0 to 7.6), sites 1, 5, 6, 7, 11, 13 and 16.

Perichaena pedata (Lister & G. Lister) G. Lister ex E. Jahn (mc) Represented by six specimens (including 33749 and 34016), recorded from ground litter and lianas (pH 6.8 to 7.0), sites 4 and 5. All of these specimens have a stipe that is shorter than what is given in published descriptions of this species but conform in all other respects.

Perichaena vermicularis (Schwein.) Rostaf. (mc) Represented by 22 specimens (including 33901, 34033 and 34128), recorded on aerial litter, bark, ground litter, lianas and twigs (pH 5.8 to 8.0), sites 1, 2, 3, 4, 5, 6, 11, 13, 18, 19, 20 and 21. Eight specimens were associated with ground litter.

Physarum aeneum (Lister) R.E. Fr. (mc) Represented by three specimens (including 34179 and 34225), recorded from twigs (pH 5.9 to 6.1), sites 1 and 4. This species is a new record for Australia. *Physarum aeneum* is not particularly common, and the majority of records are from North America (Martin & Alexopoulos 1969). However, the bronze-colored, glossy and usually wrinkled peridium is distinctive.

Physarum album (Bull.) Chevall. (mc) Represented by four specimens (including 33972 and 34150), recorded from lianas and bark (pH 4.4 to 6.9), sites 1, 4 and 8.

Physarum bivalve Pers. (mc) Represented by nine specimens (including 34142 and 34176), recorded on ground litter and twigs (pH 5.5 to 7.1), sites 6 and 13. Five of the nine specimens (56%) were recorded on the ground litter of Norfolk Island pine.

Physarum cinereum (Batsch) Pers. (f, mc) This species was first collected by Heino Lepp in 1995 and is represented by a single specimen. This is HL1333, Hundred Acres Reserve, on dead leaves in a *Eucalyptus* plantation, 1 May 1995. In the present study, it was represented by four specimens (including 33733 and 33935), recorded on aerial litter and ground litter (pH 6.2 to 7.0), sites 1, 6 and 10.

Physarum compressum Alb. & Schwein. (mc) Represented by 34 specimens (including 33726, 33908 and 34306), on aerial litter, lianas and ground litter (mc, pH 4.9 to 7.4), sites 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 13 and 20. Fourteen specimens were associated with aerial litter, 10 with ground litter, and nine with lianas.

Physarum crateriforme Petch (mc) Represented by three specimens (including 33764 and 34213), recorded on bark and ground litter from Norfolk Island pine (pH 7.2 to 7.3), sites 4 and 8.

Physarum decipiens M.A. Curtis (mc) Represented by 24 specimens (including 33803, 33982 and 34063), recorded on aerial litter, bark, ground litter, lianas and twigs (pH 5.4 to 6.9), sites 4, 5, 6, 8, 12 and 14.

Physarum flavocomum Berk. (f, mc) This species was first collected by Heino Lepp in 1995 and is represented by a single specimen. This specimen is HL1736A, Emily Bay, on a long-fallen branch lying on the ground, 18 May 1997. *Physarum flavocomum* was recorded in the present study when a yellow plasmodium, collected in the field from site 8 yielded numerous fruiting bodies when placed in a Petri dish.

Physarum gyrosum Rostaf. (mc) Represented by nine specimens (including 33739 and 34015), recorded on aerial litter (pH 5.4 to 7.9), sites 1, 2, 5, 6, 10, 13 and 19.

Physarum lakhanpalii Nann.-Bremek. & Y. Yamam. (mc) Represented by single specimen (34296), recorded on ground litter (pH 6.5), site 4. This species is morphologically similar to *Physarum decipiens* but can be distinguished from the latter on the basis of the clustered spores.

Physarum melleum (Berk. & Broome) Massee (f, mc) This species was first collected by Heino Lepp in 1995 and is represented by two specimens. These are HL1332, Hundred Acres Reserve, on dead leaves in a *Eucalyptus* plantation, 1 May 1995 and HL1335, on dead leaves in a *Eucalyptus* plantation, 1 May 1995. In the present study it was represented by six specimens (including 33884 and 34159), recorded on aerial litter and lianas (pH 6.5 to 7.2), sites 3, 4, 8 and 20.

Physarum oblatum T. Macbr. (mc) Represented by 41 specimens (including 33718, 33765 and 34156), recorded on aerial litter, ground litter, lianas and twigs (pH 5.2 to 7.7), sites 1, 2, 3, 4, 5, 6, 7, 8, 12 and 15. Sixteen (39%) of all specimens were recorded from lianas.

Physarum pusillum (Berk. & M.A. Curtis) G. Lister (mc) Represented by 40 specimens (including 33750, 33885 and 34043), recorded on aerial litter, ground litter, lianas and twigs (pH 5.2 to 7.2), sites 1, 3, 4, 5, 6, 8, 12, 13, 15, 20 and 21. Almost half (45%) of all species were associated with ground litter.

Physarum roseum Berk. & Broome (f) This species was first collected by Heino Lepp in 1995 and is represented by two specimens. These are HL1229, West Palm Glen Track, on decaying wood, 23 April 1995; and HL1300, Bird Rock Track, on decaying wood, 30 April 19. It was not recorded in the survey carried out in 2019, although red plasmodia (which are a distinctive feature of *Physarum roseum)*, are in two moist chamber cultures. However, these did not produce fruiting bodies.

Stemonitis fusca Roth (mc) Represented by 17 specimens (including 33801, 33871 and 33918), recorded from aerial litter, ground litter, lianas and twigs (pH 5.4 to 7.4), sites 3, 4, 6, 7, 17 and 21. More than half (59%) of the specimens were associated with twigs. All of the specimens of this species recorded on Norfolk Island were *Stemonitis fusca* var. *nigrescens* (Rex) Torrend.

Stemonitis* cf. *herbatica Peck (f) This species was collected by Heino Lepp in 1995 and is represented by a single specimen (HL1199) on leaf litter in the Botanic Garden, 21 April 1995.

Stemonitis splendens Rostaf. (f) This species was collected by Heino Lepp in 1995 and is represented by a single specimen (HL1220) on underside of a fallen *Eucalyptus* trunk in a *Eucalyptus* planation along Anson Bay Road, 22 April 1995.

***Trichia* sp.** (mc) Represented by two specimens (33833 and 34300), recorded from ground litter (pH 6.0 and 6.1), site 6. Each specimen consisted of a single well-developed fruiting body. It seems likely that this species is undescribed, but there is not enough material to propose it as new to science. A brief description is given below.

Fruiting body a stalked sporangium, 0.8 mm high; *sporotheca* globose; *hypothallus* inconspicuous; *stalk* stout, dark, approximately 60 percent of the total height of the fruiting body; *peridium* thin, shiny, bright yellow; *capillitium* consisting of long, yellow threads, 3–4 µm in diameter, with scattered spines up to 4 um long; *spores* yellow in mass, 7.5–8.5 µm in diameter, very finely warted; *plasmodium* not observed.

Willkommlangea reticulata (Alb. & Schwein.) Kuntze (mc) Represented by two specimens (33981 and 34163), both recorded from twigs (pH 5.9 and 6.1), site 4.

Discussion

The almost complete absence of fruiting bodies of myxomycetes in the field on Norfolk Island was unexpected but presumably reflects the fact that there must have been relatively little rainfall during the weeks prior to our visit to the island, although May, June and July have an average of 130 mm or more of precipitation (https://www.climatestotravel.com/climate/norfolk-island). However, of these three months, June tends to the driest. Woody substrates were invariably very dry, even those portions in direct contact with the ground. Another factor may have been the fact that many of the larger woody substrates (mostly logs on the forest floor) were derived from Norfolk Island pine, and it is possible that the wood of this tree is not especially favorable for the growth and development of myxomycetes. Based on the extensive field experience of the first author, fruiting bodies appear to be relatively uncommon on the wood from some types of trees (e.g., *Betula* spp. [birch]) in the Northern Hemisphere). Why this is the case is unknown.

The survey effort on Norfolk Island clearly indicates the value of using moist chamber cultures to complement field collections when studying myxomycetes. In an earlier study on Christmas Island (Stephenson and Stephenson 2019), both methods were used. Although the number of field collections was appreciably higher than the total recorded on Norfolk Island, moist chamber cultures also were more productive. The mean number of species recovered per culture for Christmas Island was 2.2, whereas the comparable figure for Norfolk Island was 1.4. The total number of species now known from Norfolk Island (55) is less than the number reported for Christmas Island (69) but exceeds the totals reported for Cocos Island (41 species) by Rojas and Stephenson (2008), Mahé Island in the Seychelles (47 species) by Krivomaz et al. (2017) and Ascension Island (36 species) by Stephenson (2008). However, all of these numbers are lower than the 96 species and infraspecific taxa reported from La Réunion Island by Adamonyte et al. (2011).

Species of myxomycetes are known to show varying degrees of specificity for the substrates with which they are associated. For example, some species are almost always associated with ground litter, the dung of herbivores or the dead outer bark of living trees (Stephenson and Stempen 1994). *Arcyria cinerea*, the species represented by the largest number of specimens in the present study, displays very little substrate specificity, since it was recorded from every major type of substrate. In contrast, *Macbrideola decapillata* was recorded only from the bark of Norfolk Island pine. If the concept of niche is applied to myxomycetes, as described by Stephenson (1988), *A. cinerea* would be considered as having a broad niche whereas the niche of *M. decapillata* would be relatively narrow. As indicated in the information presented along with each species in the annotated checklist portion of this paper, some of the other species represented by more than a very few species appeared to display a preference for a particular substrate. For example, most specimens of *Cribraria violacea* were associated with bark or twigs (which have a thin bark), and the majority of specimens of *Physarum bivalve* were associated with ground litter. Interestingly, at least 15 of the species recorded from Norfolk Island were associated with substrates (bark, ground litter and twigs) derived from Norfolk Island pine, although in only the single instance mentioned above was the species in question restricted to this tree. However, the major point to be made in this context is that myxomycetes are not absolute generalists with respect to the substrates on which they are found.

Presumably, most of the species present on any isolated island are the result of long-distance dispersal by wind, but some species may have arrived along with the large-scale introductions of exotic (introduced) plants. For example, the number of exotic plants on Christmas Island actually exceeds the total of native plants, and much of Norfolk Island is occupied by non-native vegetation, including agricultural areas and *Eucalyptus* plantations.

Although the results obtained from numerous studies that have been carried out in various regions of the world have generated a large body of data on the distribution and ecology of myxomycetes, there are still many regions that remain understudied. These include numerous examples of isolated islands. The project reported herein represented an effort to characterize more completely the assemblage of species associated with one of those islands—Norfolk Island.

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